

## CLAIMS

We claim:

1           1. A method for browsing information on a display device of a hand-held  
2 device, wherein the method comprises a virtual display being the display device of the hand-held  
3 device, a viewpoint from which the virtual display is viewed and a virtual data object comprising  
4 information to be viewed on the virtual display, wherein the method comprises the steps of:

5                 coupling the display device to a digital processor;  
6                 mapping information content generated by the digital processor into the virtual  
7 data object suitable for conveying information to the user of the hand-held device;

8                 displaying a portion of the virtual data object at a time on the display device, the  
9 virtual data object comprising characters, pictures, lines, links, video or pixels that can be  
10 conveniently displayed on the display device at a time;

11                 wherein information is browsed on the display device essentially in a mirror-like  
12 way, the method further comprising the step of:

13                 moving the portion of the virtual data object displayed on the display device in the  
14 same direction as the hand-held device is tilted, whereby a certain orientation of the hand-held  
15 device always displays the same portion of the virtual data object on the display device.

1           2. The method according to claim 1, wherein the method comprises the steps of:

2                 setting a predefined xy-plane as a xy-plane;  
3                 determining a relation between the rotation degree around the x-axis and the y-  
4 axis and the amount of the displacement of the portion on the virtual data object displayed on the  
5 display device at a time;

6                   displacing the position of the displayed portion of the virtual data object to the  
7                   right when the hand-held device is rotated essentially towards the positive rotation direction  
8                   around the y-axis;

9                   displacing the position of the displayed portion of the virtual data object to the left  
10                  when the hand-held device is rotated essentially towards the negative rotation direction around  
11                  the y-axis;

12                  displacing the position of the displayed portion of the virtual data object upwards  
13                  when the hand-held device is rotated essentially towards the positive rotation direction around  
14                  the x-axis;

15                  displacing the position of the displayed portion of the virtual data object  
16                  downwards when the hand-held device is rotated essentially towards the negative rotation  
17                  direction around the x-axis; and

18                  displaying the movement of the portion of the virtual data object on the display  
19                  device of the hand-held device according to the set relation.

1                  3.         The method according to claim 2, wherein the method comprises the step of:  
2                    changing the relation between the rotation degree around the x-axis and/or the y-  
3                  axis and the amount of the displacement of the portion on the virtual data object in proportion to  
4                  the distance between the viewpoint and the display device.

1                  4.         The method according to claim 1, wherein the movement of the portion of the  
2                  virtual data object displayed on the display device is proportional to the change amount and/or  
3                  rate of the rotational movement around the x-axis and/or y-axis.

1        5. The method according to claim 1, wherein the method comprises the steps of:  
2              setting the display device into a zoom mode;  
3              determining the distance between the viewpoint and the display device; and  
4              zooming in or out the displayed information based on the determined distance  
5              information.

1        6. The method according to claim 1, wherein the method comprises the steps of:  
2              setting the display device into a zoom mode; and  
3              zooming in or out the displayed information when rotating the hand-held device  
4              around the axis being essentially perpendicular to the predefined xy-plane.

1        7. The method according to claim 1, wherein the method comprises the steps of:  
2              setting the display device into a zoom mode; and  
3              zooming in or out the displayed information when the hand-held device is tilted.

1        8. The method according to claim 1, wherein the information displayed on the  
2              display device essentially depends on the location and orientation of the virtual display, the  
3              viewpoint and the virtual data object.

1        9. The method according to claim 1, wherein the method comprises the steps of:  
2              setting the display device surface level as an xy-plane;  
3              determining a relation between the x-axial and/or y-axial movement of the hand-  
4              held device and the amount of the displacement of the portion of the virtual data object displayed  
5              on the display device at a time; and

6                         moving the portion of the virtual data object displayed on the display device in the  
7                         same direction as the hand-held device is moved in the xy-plane according to the relation  
8                         information.

1                 10.         The method according to claim 1, wherein filtering the x-axial, y-axial and/or  
2                         tilting movements before displaying the movements on the display device.

1                 11.         The method according to claim 1, wherein changing the relation between the  
2                         rotation degree around the x-axis and y-axis and the amount of the displacement of the portion of  
3                         the virtual data object displayed on the display device at a time.

1                 12.         The method according to claim 1, wherein the method comprises the step of:  
2                         keeping the orientation of the information displayed on the display device  
3                         unchanged when rotating the hand-held device around the axis being essentially perpendicular to  
4                         the surface level of the hand-held device.

1                 13.         A hand-held device for browsing information,  
2                         wherein the hand-held device comprises a virtual display being the display device  
3                         of the hand-held device, the hand-held device comprising:  
4                         a digital processor (30);  
5                         a memory (60,70) coupled to the digital processor (30), the memory (60,70)  
6                         comprising a virtual data object suitable for conveying information to the user of the hand-held  
7                         device;  
8                         a display device (10) coupled to the digital processor (30);

9           means (30) for moving the portion of the virtual data object displayed on the  
10          display device in the same direction as the hand-held device is tilted, whereby a certain  
11          orientation of the hand-held device always displays the same portion of the virtual data object on  
12          the display device.

1           14.       The hand-held device according to claim 13, wherein the hand-held device  
2          comprises:

3           means (30) for setting an xy-plane as a default xy-plane;

4           relation information (60) based on the rotation degree around the x-axis and y-  
5          axis and the amount of the displacement of the portion of the virtual display space displayed on  
6          the display device at a time;

7           means (30) for determining the rotation amount around the x-axis and/or y-axis;

8          and

9           means (30) for changing the location of the portion of the virtual data object  
10         displayed on the display device (10) based on the rotational amount around the x-axis and/or y-  
11         axis and the relation information (REL).

1           15.       The hand-held device according to claim 13, wherein the hand-held device  
2          comprises means (30) for changing the relation information (60).

1           16.       The hand-held device according to claim 13, wherein the hand-held device  
2          comprises:

3           means (30) for setting the display device into a zoom mode;

4 means (20,50) for determining the distance between the viewpoint and the display  
5 device; and

6 means (30) for zooming in or out the displayed information based on the distance  
7 information.

1 17. The hand-held device according to claim 13, wherein the hand-held device  
2 comprises means (30) for zooming in or out the displayed information when rotating the hand-  
3 held device around the axis being essentially perpendicular to the predefined xy-plane.

1 18. The hand-held device according to claim 13, wherein the hand-held device  
2 comprises:

3 means (30) for setting the display device surface level as an xy-plane;  
4 relation information (60) between the x-axial and/or y-axial movement of the  
5 hand-held device and the amount of the displacement of the portion of the virtual data object  
6 displayed on the display device at a time;

7 means (30) for determining the amount of displacement in the xy-plane; and  
8 means (30) for moving the portion of the virtual data object displayed on the  
9 display device (10) in the same direction as the hand-held device is moved in the xy-plane  
10 according to the relation information (60).

1 19. The hand-held device according to claim 13, wherein the hand-held device  
2 comprises means (30) for filtering the x-axial, y-axial and/or tilting movements before displaying  
3 the movements on the display device (10).

1        20.      The hand-held device according to claim 13, wherein the hand-held device  
2      comprises means (30) for changing the relation (60) between the rotation degree around the x-  
3      axis and y-axis and the amount of the displacement of the portion of the virtual data object  
4      displayed on the display device (10) at a time.

1        21.      The hand-held device according to claim 13, wherein the hand-held device  
2      comprises means (30) for changing the relation (60) between the x-axial and/or y-axial  
3      movement of the hand-held device and the amount of the displacement of the portion of the  
4      virtual data object displayed on the display device at a time.

1        22.     A computer program embodied on a computer-readable medium, wherein the  
2      computer program executes the program steps recorded in a computer-readable medium to  
3      perform a method for browsing information on a display device of a hand-held device, wherein  
4      the method comprises a virtual display being the display device of the hand-held device, a  
5      viewpoint from which the virtual display is viewed and a virtual data object comprising  
6      information to be viewed on the virtual display, wherein the method comprises the steps of:

7                coupling the display device to a digital processor;  
8                mapping information content generated by the digital processor into the virtual  
9      data object suitable for conveying information to the user of the hand-held device;  
10               displaying a portion of the virtual data object at a time on the display device, the  
11      virtual data object comprising characters, pictures, lines, links, video or pixels that can be  
12      conveniently displayed on the display device at a time;

13           wherein in the method information is browsed on the display device essentially in a  
14       mirror-like way, the method further comprising the step of:

15           moving the portion of the virtual data object displayed on the display device in the same  
16       direction as the hand-held device is tilted, whereby a certain orientation of the hand-held device  
17       always displays the same portion of the virtual data object on the display device.

1           23.       The computer program according to claim 22, wherein the computer program  
2       executes the steps of:

3           setting a predefined xy-plane as a xy-plane;  
4           determining a relation between the rotation degree around the x-axis and the y-  
5       axis and the amount of the displacement of the portion on the virtual data object displayed on the  
6       display device at a time;

7           displacing the position of the displayed portion of the virtual data object to the  
8       right when the hand-held device is rotated essentially towards the positive rotation direction  
9       around the y-axis;

10           displacing the position of the displayed portion of the virtual data object to the left  
11       when the hand-held device is rotated essentially towards the negative rotation direction around  
12       the y-axis;

13           displacing the position of the displayed portion of the virtual data object upwards  
14       when the hand-held device is rotated essentially towards the positive rotation direction around  
15       the x-axis;

16               displacing the position of the displayed portion of the virtual data object  
17       downwards when the hand-held device is rotated essentially towards the negative rotation  
18       direction around the x-axis; and  
19               displaying the movement of the portion of the virtual data object on the display  
20       device of the hand-held device according to the set relation.

1               24.       The computer program according to claim 22, wherein the computer program  
2       executes the step of:

3               changing the relation between the rotation degree around the x-axis and/or the y-  
4       axis and the amount of the displacement of the portion on the virtual data object in proportion to  
5       the distance between the viewpoint and the display device.

1               25.       The computer program according to claim 22, wherein the movement of the  
2       portion of the virtual data object displayed on the display device is proportional to the change  
3       amount and/or rate of the rotational movement around the x-axis and/or y-axis.

1               26.       The computer program according to claim 22, wherein the computer program  
2       executes the steps of:

3               setting the display device into a zoom mode;  
4               determining the distance between the user of the hand-held device to the display  
5       device; and  
6               zooming in or out the displayed information based on the determined distance  
7       information.

1        27.     The computer program according to claim 22, wherein the computer program  
2 executes the steps of:

3                setting the display device into a zoom mode; and  
4                zooming in or out the displayed information when rotating the hand-held device  
5 around the axis being essentially perpendicular to the surface level of the hand-held device.

1        28.     The computer program according to claim 22, wherein the computer program  
2 executes the steps of:

3                setting the display device into a zoom mode; and  
4                zooming in or out the displayed information when the hand-held device is tilted.

1        29.     The computer program according to claim 22, wherein the information displayed  
2 on the display device essentially depends on the location and orientation of the virtual display,  
3 the viewpoint and the virtual data object.

1        30.     The computer program according to claim 22, wherein the computer program  
2 executes the steps of:

3                setting the display device surface level as an xy-plane;  
4                determining a relation between the x-axial and/or y-axial movement of the hand-  
5 held device and the amount of the displacement of the portion of the virtual data object displayed  
6 on the display device at a time; and  
7                moving the portion of the virtual data object displayed on the display device in the  
8 same direction as the hand-held device is moved in the xy-plane according to the relation  
9 information.

1        31.     The computer program according to claim 22, wherein filtering the x-axial, y-  
2     axial and/or tilting movements before displaying the movements on the display device.

1        32.     The computer program according to claim 22, wherein changing the relation  
2     between the rotation degree around the x-axis and y-axis and the amount of the displacement of  
3     the portion of the virtual data object displayed on the display device at a time.

1        33.     The computer program according to claim 22, wherein the computer program  
2     executes the step of:

3                 keeping the orientation of the information displayed on the display device  
4     unchanged when rotating the hand-held device around the axis being essentially perpendicular to  
5     the surface level of the hand-held device.